

LW400/LW400A/LW400B WaveStation Specifications

Generator Mode

Standard Function Waveforms - 1 Hz Resolution

Sine, 1 Hz - 100 MHz
 Square, 1 Hz - 50 MHz
 Triangle, 1 Hz - 25 MHz
 Ramp, 1 Hz - 25 MHz
 Pulse, (period)20 ns - max. memory
 DC
 Frequency Sweep Linear / Log
 Multitone, 1-10 tones, 1 Hz - 100 MHz

Arbitrary Functions:

Waveform Creation

Interactive Graphical editor on Internal 9" CRT

Standard Functions

Sine, Square, Triangle, Ramp, Pulse,
 DC

Equation Editor

Waveform (array) Math
 Waveform Import From
 Digital Oscilloscope
 Floppy Disk

Waveform Feature Time Resolution:

100 ps

Available memory:

256k/ch. standard, 1 Mpoint optional

Minimum segment length:

64 points

Maximum segment length:

Up to available memory (1Mpoint when optional memory installed)

Segment length resolution:

1 point

Number of links:

512 for 256k memory
 2048 for 1M memory

Internal Noise Generator:

Available in LW400 and LW400A only

Independent pseudorandom white noise generator with Gaussian distribution and 2^{22} states

Appendix B

Waveform Output Characteristics

**Output channels:**

LW410/LW410A - 1 Channel

LW420/LW420A - 2 Channel

Output Impedance:

50 Ω , \pm 5%

DC Accuracy:

\pm (2% of setting +40 mV) for output > 500 mV peak-peak

\pm (2% of setting +15 mV) for output \leq 500 mV peak-peak

Vertical resolution:

8 bits

Minimum output voltage:

10 mV p-p into 50 Ω

Maximum output voltage:

10 V p-p into 50 Ω

Offset voltage range:

\pm 5 V into 50 Ω . The output voltage (signal + offset) must be in the range \pm 5 V into 50 Ω .

Offset voltage resolution:

0.05% of full scale

Output bandwidth:

100 MHz (-3dB) (widest bandwidth)

Total harmonic distortion:

<5 V p-p <-45 dBc (-50 dBc typical)

for sinusoidal output \leq 1MHz

<-35dBc

for sinusoidal output 1 MHz to 20 MHz (<-45 dBc typical)

<-25 dBc

to 50 MHz (<-40 dBc typical) (predominantly 2nd harmonic)

Spurious & non-harmonic distortion:

<-60 dBc for frequencies \leq 1 MHz for output

Signal-to-noise ratio:

>40 dB (-45 typical) for output amplitudes >100 mV @ 0 offset

Transition times: @ widest bandwidth with band limiting off

LW400/LW400A/LW400B: < 6 ns 10%- 90%

LW400/LW400A/LW400B: < 5 ns 10%- 90% @ widest bandwidth with band limiting off

Overshoot and ringing:

<8% of step size max. 3% typical

Settling time:

<50 ns to within 3% of step size @ widest bandwidth

Inter-channel crosstalk: <1%**Squarewave Symmetry:** < 6 ppm + 0.5 ns

Pulse Generator Characteristics:

Pulse repetition frequency(max): 50 MHz
 Pulse repetition frequency(min):
 Limited by Channel memory and clock speed
 Frequency accuracy: ± 3 ppm over operating temperature range
 Pulse width(max): Limited by channel memory and clock speed
 Pulse width(min): 10 ns
 Pulse width accuracy:
 ± 3 ppm + 0.5 ns for widths > 2x the risetime
 Pulse delay Characteristics:
 Same as trigger delay with the following exception.
 pulse time delay resolution = 1 ns

Ch 1 to Ch 2 skew:

<1 ns for identical waveforms in each channel (widest bw)



Output protection:

± 20 V

Output filtering:

The following filter cutoff frequencies will be available;
 100 MHz Gaussian, 10 MHz Gaussian, 1 MHz Gaussian, 100 kHz Gaussian, 10 kHz Gaussian

Sample clock characteristics:

(with internal 10 MHz reference)

Maximum sample rate:

400 MS/second

Accuracy:

± 3 ppm over operating temperature range

Stability:

Aging <1 ppm/year

SSB Phase Noise:

LW410/LW420: <-95 (-100 typical) dBc/Hz @ 10 KHz
 offset for a 10 MHz sine wave at output

LW410A/LW420A: <-90 dBc/Hz @ 10 KHz offset for a 10 MHz sine wave at output

Resolution: 1 Hz

Variable Clock

LW400A and LW400B series only

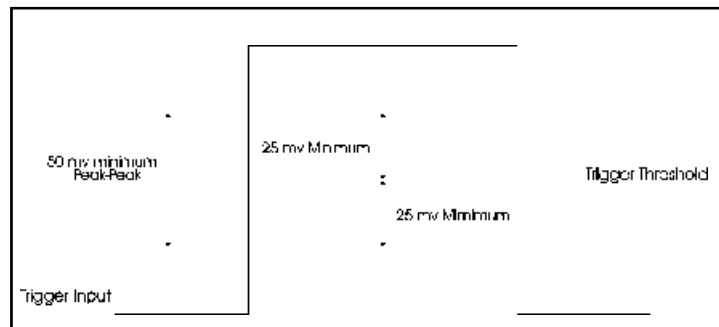
Variable over range of 6 KHz to 400 MHz

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Triggering Characteristics



Trigger slope:	Positive or Negative
Trigger input impedance:	$50 \Omega \pm 5\%$
Threshold range:	$\pm 2.5V$
Threshold resolution:	20 mV
Threshold accuracy:	$\pm 100 \text{ mV}$
Threshold sensitivity:	50 mV minimum p-p
Minimum pulse width:	$\leq 5 \text{ ns}$
Protection:	$\pm 5 \text{ V}$



Trigger Modes

Continuous:

Runs continuously

Single:

Outputs 1 repetition of the waveform for each trigger received. Triggers received while the waveform is still running are ignored.

Burst:

Outputs the selected waveform a programmable number of times in response to a trigger. The maximum number of repetitions for a burst is 4,096. Triggers received while the burst is running are ignored.

Gated:

The waveform starts on the leading edge of the gate signal and stops on completion of the waveform cycle occurring at the trailing edge of the gate signal.

Trigger Delay

Minimum(min) delay time:

35 ns \pm 3.5 ns +5 sample clocks

Maximum delay time:

(2³²-1) sample clocks

Delay resolution:

1 sample clock. The delay will be programmed in units of seconds. When operating from the front panel the resolution (sample clock period) will be shown to the user and the delay will change in increments of that value.

Delay accuracy:

\pm (0.0003% x programmed value)+min delay time+delay jitter

Note: The min delay time is a fixed value for each instrument at the selected sample clock rate. Considering this fact, the time delay at a specific sample clock rate can be measured and used to offset the programmed value to obtain the desired time delay.

offset programmed value = desired value - measured delay

In this case the delay accuracy is:

\pm (0.0003% x offset programmed value)+delay jitter

Delay jitter:

1 sample clock

Trigger Sources

Manual:

Front panel pushbutton

External:

Front panel BNC connector

GPIB:

A trigger command may be issued over the GPIB bus

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Auxiliary Inputs



External 10 MHz reference: A rear panel input is provided that allows an external reference clock to be input. 400 mV p-p to 5 V p-p into 50 Ω .

Noise Input: ± 500 mV maximum into 50 Ω .

Auxiliary Outputs



10 MHz reference output:

Frequency accuracy: ± 3 ppm

Amplitude (high): ≥ 1.6 v into 50 Ω

Amplitude (low): ≤ 0.2 v into 50 Ω

Timing marker:

1 bit of memory up to 128 transitions definable

Output levels:

ECL or TTL levels

Protection:

Outputs are protected to ± 5 V

Digital Output:

Channel 1 only, 8 bits and clock available from rear panel.

TTL/ECL logic levels simultaneously.

Noise In/Out: From rear panel BNC Connectors

Hard Copy Outputs

Supported Printers include:

Epson MX/FX

Epson LQ

HP LaserJet II

HP ThinkJet

Programmability

GPIB IEEE 488.2 compatible. Compliant with SCPI programming language. Capable of initiating and controlling waveform transfer from digital oscilloscopes by simply connecting a GPIB cable (no computer required).

General



Temperature:

5° C to 35° C full specifications;
0° C to 40° C operating;
-20° C to 70° C non-operating.

Humidity:

10% to 80% relative, non-condensing

Altitude:

< 2000 Meters (6560 ft)

Power:

90 - 132/180-250 V AC
47 - 63 Hz
4 amps @ 115 V AC (20 amps cold start surge)
2 amps @ 230 V AC (40 amps cold start surge)

The power supply is internally protected against short circuit and overload by means of a single T5.0A/250 V \sim fuse, which is not replaceable by the user.

Dimensions (HWD):

7.67, 14.92, 19.58 (inches)
19.5, 37.9, 49.7 (cm)

Weight:

27.6 lbs (12.5 kilograms)

Warranty: One year

Calibration Interval: Annually

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CE Certifications: CE, UL and cUL

The Wavestation meets requirements of the EMC Directive 89/336/EEC for Electromagnetic Compatibility and Low Voltage Directive 73/23/EEC for Product Safety. See "Declaration of Conformity" certificate for details.

Warning: This is a Class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

UL and cUL Certifications:

UL Standard: UL 3111-1

Canadian Standard: CSA-C22.2 No. 1010.1-92